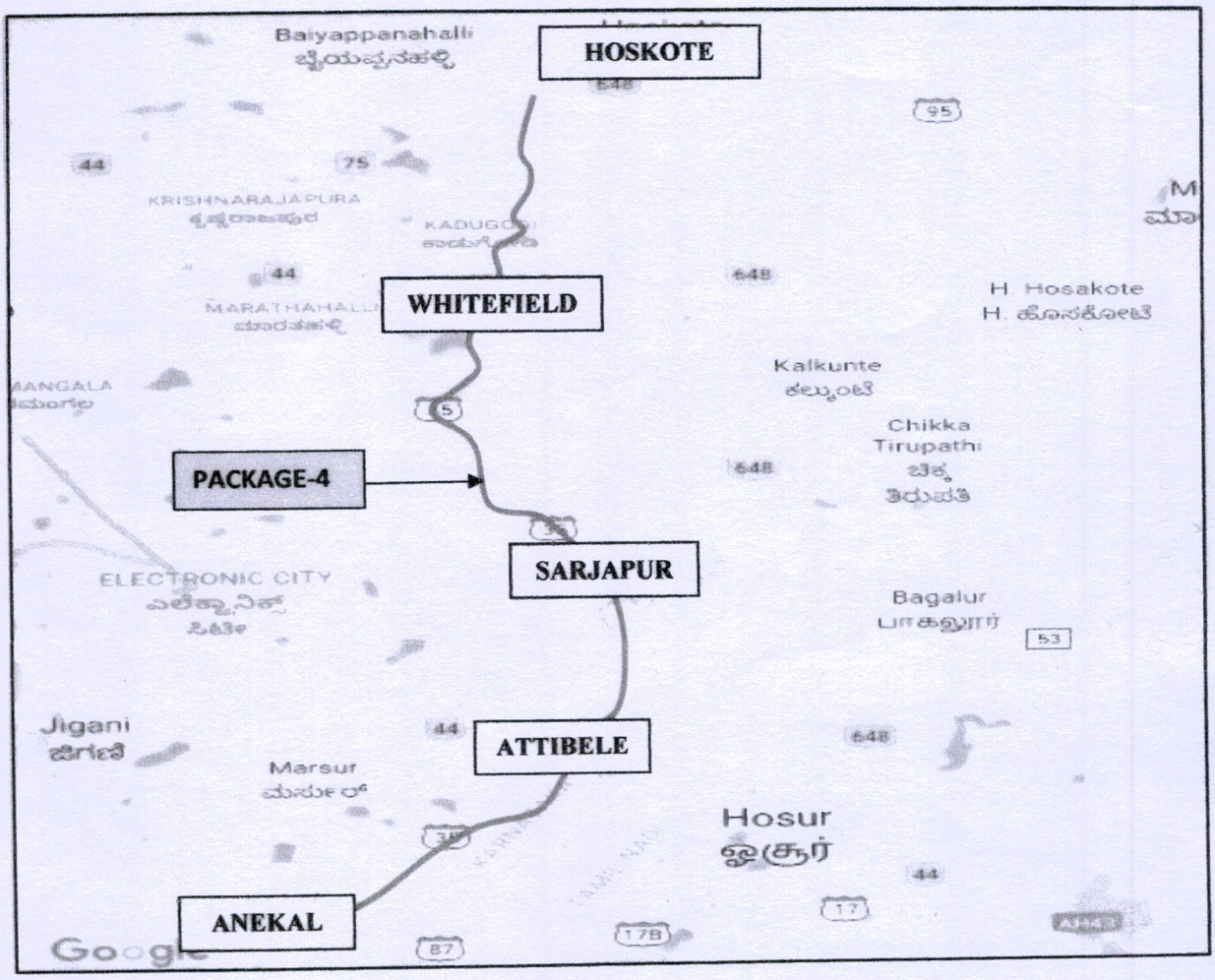
Karnataka Road Development Corporation Limited

(A Government of Karnataka Enterprise)

Feasibility Report for "Development of Road from Anekal (SH-87) to Hoskote (NH-04) via Attibele-Sarjapura-Varthuru-Whitefield Road and Kattonnallur in Bangalore Urban/rural district, Karnataka"

Executive Summary



Apt Consulting Engineering Services

55/2, Flat No.8, 15th Cross, East Park Road,
Malleshwaram, Bangalore - 560 055

EXECUTIVE SUMMARY

0.1 Background

Bangalore, the capital of Karnataka is the fifth largest city in the country and is growing at a rate, which is significantly higher than most others. Due to the growth in economic activities, the city is attracting migrants. To serve this influx of population, residential layouts are being developed. Being a demographically diverse city, Bangalore today has developed into India's major economic hubs and is the fastest growing major metropolis. As the leading IT employer and exporter, it is known as the Silicon Valley of India. But adequate transport infrastructure facilities such as roads, grade separators, subways, elevated corridors, mass transit system etc., matching this demand are conspicuously absent. The additional demand is to be catered by the already saturated road network. Due to the inherent road network in Bangalore, there are on the average 2 major and 2 minor junctions per kilometre of road length. This has resulted in increase in travel time due to frequent bottlenecks and breakdowns.

To ease the traffic congestion and to ensure bypassing the through traffic, Government of Karnataka (GoK) has implemented Outer Ring Road (ORR). But due to the rapid development, city has grown beyond the ORR. Nice Corridor has been implemented linking Bangalore-Mumbai Road (NH-4), Bangalore-Bantwal Road (NH-275), Bangalore-Kanakapura Road (NH-209) and Bangalore-Hosur Road (NH-7). This loop partially bypasses the through traffic in the south and south-west of Bangalore. With the commissioning of new airport at Devanahalli, the traffic originating/destined to airport from various parts of the city is continuously growing. It is reported that, airport has served 12.39 million passengers in the first half of financial year (2017-2018) and reported a growth of 11.7% in overall traffic. Further, the average passenger movement per day observed was 67,700.

To bypass the through traffic passing through the city and to ensure a better facility for the road users commuting from southern and eastern parts of the city (such as Harohalli, Anekal, Sarjapur, Varthur, Whitefield, Hoskote etc.,) to various industries in eastern part of Bangalore and to Bangalore international Airport, Government of Karnataka (GoK) has initiated the road projects to decongest the traffic within Bangalore. Further GoK has mandated Karnataka Road Development Corporation Limited (KRDCL) to implement the following four road projects:

Road No.	Road Details	Length, Km
1	Development of Road from Hoskote Budigere Cross (NH-4) to Kempegowda International Airport road via Budigere- Singahalli and Mylanahalli in Bangalore Urban/rural district, Karnataka.	22.000
2	Development of Road from Nelamangala (NH-4) to Devanahalli Road (NH-07) via Madhure-Byatha-Rajanukunte-Thimmasandra and M.V Solars in Bangalore Urban/rural district, Karnataka.	43.500
3	Development of Road from Harohalli (NH-209) to Anekal (SH-35) via Uruganadoddi-Jigani and KIADB Industrial Area in Bangalore Urban/rural district, Karnataka.	42.000
4	Development of Road from Anekal (SH-87) to Hoskote (NH-04) via Attibele-Sarjapura-Varthuru-Whitefield Road and Kattonnallur in Bangalore Urban/rural district, Karnataka.	47.500
	Total	155.000

With the implementation of improvements to the roads as above, it is expected that improved roads would ensure enhanced level-of-service, driving comfort and safety of commuting traffic apart from reducing traffic congestion on city roads. In addition to the better facility for the commuters accessing the various industries and airport (as above), these roads would also serve the commuting needs of various major settlements/villages located along and close to the project road.

0.2 Site Characteristics

The road section between Besthamanahalli (on SH-35 near Anekal) to Hoskote (on NH-4) is 42.660 km in length and it passes through Attibele, Biddaraguppe, Sarjapura, Dommasandra, Gunjur, Varthur, Whitefield and Kadugodi. The slicing of the project road is judiciously proposed so as to ensure ease of implementation of the project with minimum inconvenience to road users, to reap maximum benefits as early as possible and with minimum time period.

Proposed Road Section Details

Road No.	Road Details	Length, Km
4A	Section between Besthamanahalli (on SH-35 near Anekal) to Hoskote (on NH-4) - At-grade roads only	39.280
4B1	Section between Besthamanahalli (on SH-35 near Anekal) to Hoskote (on NH-4) - Elevated Corridor (at Varthur) only.	1.300
4B2	Section between Besthamanahalli (on SH-35 near Anekal) to Hoskote (on NH-4) - Grade Separators (at Tally Junction, Dommasandra Junction and Varthur Kodi Junction) and ROB (Kadugodi) only	2.080
	Total	42.660

The land use on either side is predominantly irrigated agricultural land and near residential / commercial (Hotels, shops etc.) near settlements. The project road passes through several settlements such as Attibele, Biddaraguppe, Sarjapura, Dommasandra, Gunjur, Varthur, Whitefield and Kadugodi. The project road passes generally through plain terrain. The existing Road section comprises of

two lane/ four lane divided carriageway with bituminous surfacing. Inadequate/lack of drainage and illumination is conspicuous. Along the project road there are eight major junctions.

Details of Village/Settlements

Sl. No	*Village/Settlement*	*From (Km)*	*To (Km)*
	Package 4		
1	Besthamanahalli	0.000	0.400
2	Mayasandra	3.200	3.700
3	Harohalli	4.400	4.700
4	Attibele	6.920	9.550
5	Bidaraguppe	11.150	12.050
6	Medihalli	13.000	14.000
7	Thyavakanahalli	14.000	15.000
8	Billapura	15.000	16.000
9	Sarjapur	17.000	17.530
10	Dommasandra	22.610	23.030
11	Gunjur	26.630	27.130
12	Varthur	28.860	30.160
13	Whitefield	31.720	34.510
14	Kadugodi	35.860	36.510
15	Kattanallur	41.660	42.660

Major Junctions

Sl. No.	*Location*	*Type of Junction*	*Description*
	Package 4		
1	Km 0.000	Y	Start of Project Road (at the end of proposed Anekal bypass) with existing Jigani-Anekal Road near Besthamanahalli
2	Km 6.600	Y	Project Road with Raykottai Road (Tally Junction)
3	Km 7.900	+	Project Road with Bangalore-Hosur Road (NH-7) - Existing Grade separated junction at Attibele
4	Km 17.530	T	Project Road with Bagalur-Sarjapura Road near Sarjapura Police Station
5	Km 22.370	Y	Project Road with Bangalore-Sarjapura Road near Dommasandra
6	Km 31.480	T	Project Road with old Airport Road near Varthur Kodi
7	Km 34.510	+	Project Road with Chikka Tirupathi Road (Hoodi/Channasandra/ITPL roads) at Hope Farm (Hope Farm Junction)
8	Km 42.660	+	Project Road with Bangalore-Hoskote Road (NH-4) - Existing Grade separated junction at Hoskote

0.3 Engineering Surveys and Field Investigations

The following primary surveys were conducted as per standard practices to assess condition of road and CD structures, soil characteristics, traffic

characteristics etc., to assess the needs of improvement for the existing project road:

- *Reconnaissance Survey*
- *Road Inventory Survey*
- *Pavement Condition Survey*
- *Traffic Survey*
- *Topographic/Levelling Survey*
- *Inventory and Condition Survey of Bridges and CD Structures*

0.4 Design Standards

Design standards relevant to the project road along with the broad list of design parameters and the relevant IRC codes/specifications have been compiled under the following heads:

- *Design Standards Related to Geometric Design and Road Capacity*
- *Design Standards Related to Pavement Design*
- *Design Standards Related to Road Drainage*
- *Design Standards Related to Road Furniture and Appurtenances*
- *Design Standards Related to Bridges and CD Structures*

0.5 Data, Analysis and Improvement Proposals

0.5.1 Traffic Data Analysis and Traffic Loading for Pavement Design

Average Daily Traffic at different locations is presented below:

Summary of Traffic Volume (September 2017)

Vehicle Type		*Km 5.000, near Talli Junction*	*Km 15.000, Near Billapura*	*Km 20.000, Near Dommasandra*	*Km 26.600, Near Gunjur*	*Km 33.200, Near Hope Farm Junction*	*Km 41.000, Near Kattanallur*
Package		Package 4					
Two Wheelers		6492	11769	18860	17319	19873	18114
Auto Rickshaw		173	267	524	414	1507	1481
Car/Jeep/Van/Taxi		3283	7262	10718	12158	17858	16842
Mini Bus		120	306	597	452	1383	1658
Standard Bus		254	343	1225	686	1564	2665
LCV		1039	2557	1163	2137	2263	2659
2 Axle Truck		537	2172	733	955	1085	2183
3-Axle Truck		203	1519	951	692	421	789
MAV (>3 Axle)		28	415	418	255	149	374
OSV		0	11	15	28	31	102
Others (HCM/EME)		19	19	8	25	42	51
Agriculture Tractor		25	25	65	4	85	79
Agri. Tractor with Trailer		27	60	44	88	12	14
A/H Drawn Vehicles		3	3	7	6	5	5
Cycle		42	55	108	60	278	301
Cycle Rickshaw		0	0	3	1	2	4
Total	Vehicles	12245	26783	35439	35280	46558	47321
	PCU	11811	32121	34288	33892	45010	53204

On the basis of homogeneity of traffic the project corridor is classified into following seven sections.

- *Package 4 A*
  - ***Section-1: Start of Project Road from Km 0.000 (near Besthamanahalli) to Km 6.600 (Tally Junction), L = 6.600 kms***
  - *Section-2: From Km 6.600 (Tally Junction) to Km 17.530 (Sarjapura), L = 10.930 kms*
  - *Section-3: From Km 17.530 (Sarjapura) to Km 22.370 (Dommasandra), L = 4.840 kms*
  - *Section-4: From Km 22.370 (Dommasandra) to Km 31.480 (Varthur Kodi Junction), L = 9.110 kms*
  - *Section-5: From Km 31.480 (Varthur Kodi Junction) to Km 34.510 (Hope Farm Junction), L = 3.030 kms*
  - *Section-6 From Km 34.510 (Hope Farm Junction) to Km 42.660 (Hoskote), L = 8.150 kms*

Average Daily Traffic (ADT) for these homogeneous sections is presented in below:

Section	From - To	ADT	
		Nos.	PCU
1.	Km 0.000 to Km 6.600	12245	11811
2.	Km 6.600 to Km 17.530	26783	32121
3.	Km 17.530 to Km 22.370	35439	34288
4.	Km 22.370 to Km 31.480	35280	33892
5.	Km 31.480 to Km 34.510	46558	45010
6.	Km 34.510 to Km 42.660	47321	53204

Design Traffic Loading

The expected cumulative standard axles in the horizon year vary in the range of 15.2-71.1 msa (15 year) and 25.1-118.0 msa (20 year) for the project road respectively for the homogenous sections as detailed below:

Section wise Traffic Loading for the Project Road

Sl. No.	Road Section	Bus	LCV	2AT	3AT	MAV	Total	CSA in Millions		
								10 Years	15 Years	20 Years
1	HS1 - Km 0.000 to Km 6.600	254	1039	537	203	28	2061	8.2	15.2	25.1
2	HS2 - Km 6.600 to Km 17.530	343	2557	2172	1519	426	7017	38.4	71.1	118.0
3	HS3 - Km 17.530 to Km 22.370	1225	1163	733	951	433	4505	17.2	31.9	53.1
4	HS4 - Km 22.370 to Km 31.480	686	2137	955	692	283	4753	20.5	38.2	63.6
5	HS5 - Km 31.480 to Km 34.510	1564	2263	1085	421	204	5537	18.8	34.4	56.3
6	HS6 - Km 34.510 to Km 42.660	2665	2659	2183	789	527	8823	29.3	53.0	85.9

0.5.2 Road Inventory

The existing lane configuration comprise of 25.840 Km of two lane (60.6%) and 16.82 Km of four lane (39.4%).

0.5.3 Test Pit Investigation and Subgrade Evaluation

Generally the top layer comprise of bituminous layer (of 50-150mm thick) over base layers (of 400-600mm thick comprising of WBM of 200-300mm and GSB/Murrum of 200-300mm) which are naturally consolidated over a period of time due to movement of traffic.

In the entire length of project road, the sub-soil comprise of major proportion of sand followed by silt and gravel. The soil is generally non-plastic and non-swelling (with relatively low values of swelling index of 20-30%). The 4-days soaked CBR value of the subgrade of natural ground below the carriageway varies from 10 - 14.

0.5.4 Existing CD structures

Along the project road there are 42 CD structures and bridges as detailed below.

Summary of Existing CD Structures and Bridges

CD Structure	Package 4 A	Package 4 B	Total
	Numbers		
Culverts	31	-	31
Minor Bridges	10	-	10
Major Bridges	1	-	1
Total	42	-	42
VUP	2 (at Attibele and at Hoskote)	-	2
ROB	-	1 (at Kadugodi)	1

0.5.5 Proposed Improvements

The improvement proposals considered are:

- Package 4 A:
  - *Four lane (2x7.50m) divided carriageway with central New Jersey crash barrier cum median (0.6m) and 1.20m wide RCC open drain on either side (18.0m road width) in rural sections;*
  - *Four lane (2x7.50m) divided carriageway with central New Jersey crash barrier cum median (0.6m) and 1.50m wide footpath cum drain (18.6m road width) in urban sections near village/settlements;*
  - *Two lane (7.50m) unidirectional carriageway with 1.50m wide footpath cum drain (10.5m road width) at Varthur lake;*
  - *Overlay provision for the existing four lane divided carriageway between Varthur Kodi Junction to Kadugodi ROB (excluding 1.6 Km proposed for white topping by BBMP); and*
  - ***Overlay provision for the existing four lane road and Widening of existing four lane road to six lane road, 2x11m wide carriageway, with 1.2m wide existing median and 1.20m wide footpath cum drain (25.6m road width) between Sarjapura Police Station and Dommasandra & between Kadugodi and Hoskote.***

- **Package 4 B:**

- **Package 4 B1:**

  - *Four Lane (2x7.50m) divided carriageway with central New Jersey crash barrier cum median (0.6m) and 2x0.5m wide kerb and crash barrier (16.6m width at elevated corridor) bi-directional Elevated Corridor at Varthur including at-grade road (2x6m) and RCC open drains (2x1.5m) (31.6m width at ramps).*

- **Package 4 B2:**

  - *Two Lane uni-directional grade separator (8.5m width at grade separator) at Tally Junction including at-grade road (6.0m & 7.5m) and RCC covered drains (2x1.5m) (25.0m width at ramps);*
  - *Two Lane uni-directional grade separator (8.5m width at grade separator) at Dommasandra Cross including at-grade road (7.5m & 11m) and RCC covered drains (2x1.5m) (28.5m width at ramps);*
  - *Four Lane (2x7.50m) divided carriageway with central New Jersey crash barrier cum median (0.6m) and 2x0.5m wide kerb and crash barrier (16.6m width at grade separator) bi-directional Grade Separator at Varthur Kodi junction including at-grade road (2x6.0m) and RCC open drains (2x1.5m) (31.6m width at ramps);*
  - *Two Lane uni-directional ROB (8.5m width at grade separator) at Kadugodi including at-grade road (6.0m) and RCC open drains (1.5m) (16m width at ramps).*

0.5.6 Design of Flexible Pavement

The design of flexible pavement for widening and new construction is based on IRC: 37-2012. The design period is 20 years (for non-bituminous layers) and 15 years (for bituminous layers). CBR value of 10% is considered for pavement design. The recommended pavement configuration and the cross section type details are given below:

Recommended Pavement Composition

Sl. No.	*Homogeneous Section*	*Pavement Composition* in mm*				
		BC	DBM	WMM	GSB	Total
1.	HS1 - Km 0.000 to Km 6.600	40	65	250	200	555
2.	HS2 - Km 6.600 to Km 17.530	40	100	250	200	590
3.	HS3 - Km 17.530 to Km 22.370	40	95	250	200	585
4.	HS4 - Km 22.370 to Km 31.480	40	95	250	200	585
5#.	HS5 - Km 31.480 to Km 34.510	40	95	250	200	585
6$.	HS6 - Km 34.510 to Km 42.660	40	95	250	200	585

*(Note - * - Laid over 500mm thick subgrade; # - Overlay requirement is 50 DBM + 40 BC, Char. Defln. 1.20mm & $ - 65 DBM + 40 BC, Char. Defln. 1.22mm)*

For improvement of entire project road the length of road in each type of cross section is given in Table below.

Proposed Carriageway Configuration (Package 4A) - Road Work

Sl. No.	*Carriageway Type*	*Length, km*
1	Four Lane Divided Carriageway and RCC open drains in Rural Section	14.150
2	Four Lane Divided Carriageway and RCC covered drains in Urban Section	9.180
3	Two Lane Carriageway and RCC covered drains in Varthur tank bund location	1.060
4	Overlay Provision in the four laned road from Varthur Kodi to Kadugodi (excluding 1.6 Km of white topping proposed by BBMP)	2.540
5	Overlay provision for the existing four laned road and widening to six lane road from Sarjapur police station to Dommasandra junction and from Kadugodi to	10.750

Sl. No.	Carriageway Type	Length, km
	Hoskote	
6	Do-nothing (Whitetopping near varthurkodi)	1.600
	Total	39.280

Proposed Carriageway Configuration (Package 4B1) - Structure work

Sl. No.	Carriageway Type	Length, km
1	Four Lane bi-directional elevated corridor (16.6m width at elevated corridor) at Varthur	1.300
	Total	1.300

Proposed Carriageway Configuration (Package 4B2) - Structure work

Sl. No.	Carriageway Type	Length, km
1	Two Lane uni-directional grade separator (8.5m width at grade separator) at Tally Junction	0.450
2	Two Lane uni-directional grade separator (8.5m width at grade separator) at Dommasandra Cross	0.480
3	Four Lane bi-directional grade separator (16.6m width at grade separator) at Varthur Kodi Junction	0.500
4	Two Lane uni-directional ROB (8.5m width at ROB) at Kadugodi	0.650
	Total	2.080

0.5.7 Junction Improvements

Comprehensive junction improvements to cater the geometric needs to the extent possible have been proposed for eight major junctions along the project road. In addition other junctions have been proposed for adequate improvements. Landscaping is proposed at the islands of all the major junctions.

0.5.8 Proposed Improvement for Bridges and CD Structures

Summary of improvement proposals to Bridges and CD structures are below:

Summary of Improvement Proposals for Bridges and CD Structures Package 4 A

Improvement proposal for	Number of Existing Structures	Re Construction	New Construction	Widening and minor maintenance	Minor maintenance	Do nothing
CD Structures						
RCC Pipe Culvert	6	-	3	5	-	1
RCC Slab Culvert	25	2	-	17	-	6
Total	31	2	3	22	-	7
Minor Bridges						
RCC Slab Bridge	10	2	-	5	-	3
Total	10	2	-	5	-	3
Major Bridges						
RCC Girder Bridge	1	-	-	-	1	-
Total	1	-	-	-	1	-

Summary of Proposals for Structures Package 4 B1

Improvement proposal for	Number of Existing Structures	Re Construction	New Construction	Widening and minor maintenance	Minor maintenance	Do nothing
Elevated Corridor						
Elevated Corridor	-	-	1 (at Varthur)	-	-	-

Summary of Proposals for Structures Package 4 B2

Improvement proposal for	*Number of Existing Structures*	*Re Construction*	*New Construction*	*Widening and minor maintenance*	*Minor maintenance*	*Do nothing*
Grade Separator Structure						
Grade Separator	-	-	3 (Tally Junction, Dommasandra Junction & Varthur Kodi Junction)	-	-	-
ROB						
ROB	-	-	1 (at Kadugodi)	-	-	-

All the CD structures have been proposed for numbering as per IRC:7-1971. At all minor bridges precast RCC posts depicting the bridge details (as per the standard posts of bridges built by KRDCL) have been proposed.

0.5.9 Drainage

Open/covered drains of Pre-cast RCC M20 and perforated precast RCC slab (M20) as top cover (to serve as footpath for pedestrians) are proposed. Drain size is kept as 1.2mx0.9m and 1.5mx0.9m (clear). Open earthen drains are proposed in the forest section. Culverts are proposed at road crossings across all the roads intersecting the project road to achieve continuity of drains in the longitudinal direction.

0.5.10 Street Furniture

Adequate road furniture comprising of road signs, road markings, delineators, guard posts and crash barriers have been proposed at appropriate locations for the safety of road users as per the guidelines stipulated in relevant IRC codes keeping in view the site requirements. At all the major junctions appropriate road signs, road markings and pedestrian crossings are proposed as per IRC. For the safety of pedestrians, raised and illuminated pedestrian crossings (Zebra Range) have been proposed. Thermoplastic materials and retro reflective sheeting are proposed. In post construction scenario, to ensure the amenities, project facilities like bus bays and truck laybyes are proposed along the project road.

0.5.11 Utility Crossing

To avoid frequent cutting of road for laying/maintaining/repair of utility services especially near settlements it is proposed to have RCC pipe duct of 300mm dia. in three rows for three utility services, at every 250m intervals across the roadway for full width near settlement locations and at every 1 Km interval in rural sections.

Land Acquisition

Based on the observed/available RoW, the extent of land acquisition is assed for the proposed improvement proposal. About 8.32 acres of land needs to be acquired along the project road of Package 4A and about 5.59 acres (1.78+3.81)

of land needs to be acquired along the project road of Package 4B to accommodate the proposed improvement proposal.

Construction Period

As the project road passes through plain/rolling terrain, twenty four month construction period is suggested adopting modern construction equipments and construction methodology.

Traffic Management and Traffic Diversion

As the project road passes through plain area and mainly in rural stretches except few settlements, an appropriate construction methodology is prerequisite to prevent disturbance to existing traffic. Disturbance to traffic is inevitable during implementation, but the same shall be kept as minimum as possible. Roads cannot be closed fully, except during night times /short periods and accordingly the major quantum of construction activities shall be scheduled during night hours. On-site activities shall be kept minimum and products from off-site activities such as footpath slabs, kerb, components of CD structures etc., shall be brought to the site in ready-to-install condition. Safety of workers and public shall be ensured in accordance with IRC: SP-55-2014 "Guidelines for Traffic Management in Work Zones". The temporary diversion road shall ensure requirements as stipulated in guidelines of IRC: SP: 55-2014.

Construction Methodology

Proper planning and strict adherence to construction program could ensure the success of the project implementation and least disturbance to movement of vehicles and least inconvenience to public. Adoption of modern construction methodology incorporating modern equipments/machineries shall be made. Strict control over implementation in terms of time and quality will go a long way in achieving the objectives of this project.

0.6 Project Cost

The estimated project cost is mainly based on the rates derived after rate analysis using KPW, P&IWTD SR 2016-17, South Zone. Quantities of each of the item have been estimated based on the improvement proposals suggested and by making use of the typical cross sections/standard drawings developed.

For Package 4A, the estimated cost of construction is Rs. 168.16 crores and the total project cost is Rs.312.08 Crores. For Package 4B1, the estimated cost of construction is Rs. 175.64 Crores and the total project cost is Rs.286.62 Crores. For Package 4B2, the estimated cost of construction is Rs. 48.80 Crores and the total project cost is Rs.133.94 Crores. Abstract of cost estimates is as below:

It is very important to preserve and maintain the road and CD structures in good/traffic worthy condition even after the construction by periodic and routine maintenance as per standard practices to preserve the precious road assets created.

Abstract of Cost Estimates (Package 4)

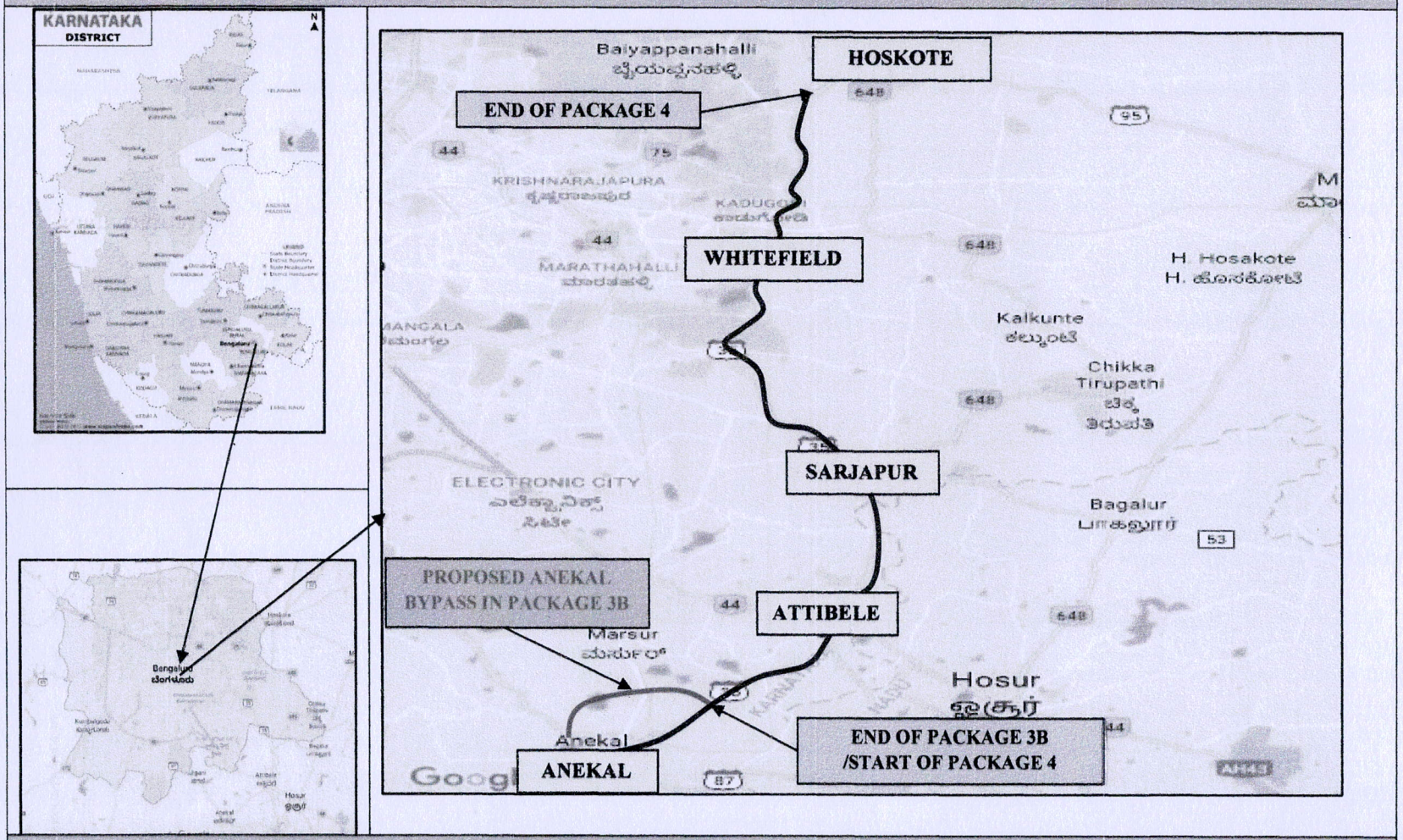
Sl. No	Item	Amount, Rs.Crores		
		Package 4A	Package 4B1	Package 4B2
1	Site Clearance and Dismantling	0.23	-	-
2	Earth Works	15.56	-	-
3	Granular Sub Base course and Base courses	41.95	-	-
4	Bituminous Courses	43.18	-	-
5	Slab, Box and Pipe Culverts	2.28	-	-
6	Major and Minor Bridges	6.10	-	-
7	Drainage and Protection Works	35.35	-	-
8	Traffic Signs, Marking and Other Appurtenances	12.30	-	-
9	Bus Bay and Truck Laybyes	2.12	-	-
10	Major and Minor Junctions	6.54	-	-
11	Retaining Wall and Toe Wall	2.56	-	-
12	Grade Separator Works (at Tally Junction)	-	-	8.64
13	Grade Separator Works (at Dommasandra Junction)	-	-	9.59
14	Elevated Corridor Works (at Varthur)	-	175.64	-
15	Grade Separator Works (at Varthur Kodi Junction)	-	-	17.09
16	ROB Works at Kadugodi	-	-	13.48
	Civil Cost, Rs. Crores	**168.16**	**175.64**	**48.80**
1	Physical Contingencies @ 5%	8.41	8.78	2.44
2	DPR and PMC Charges @ 3%	5.04	5.27	1.46
3	KRDCL Administrative Charges @ 5%	8.41	8.78	2.44
4	Road Safety Audit Charges @ 0.5%	0.84	0.88	0.24
	Price Contingencies @ 5% each for 2 years	16.82	17.56	4.88
	Total Cost Including Centages	207.68	216.91	60.27
	Land Acquisition Cost, Rs. Crores	87.58	52.14	68.79
	Utility Relocation Cost, Rs. Crores	16.82	17.56	4.88
	Total Project Cost, Rs. Crores	312.08	286.62	133.94
	Length of Project, Km	39.28	1.30	2.08
	Cost per Km with Centages	5.29	-	-
	Cost per Km without Centages	4.28	-	-
	Cost per Km Project Cost	7.94	-	-

0.7 Salient Features

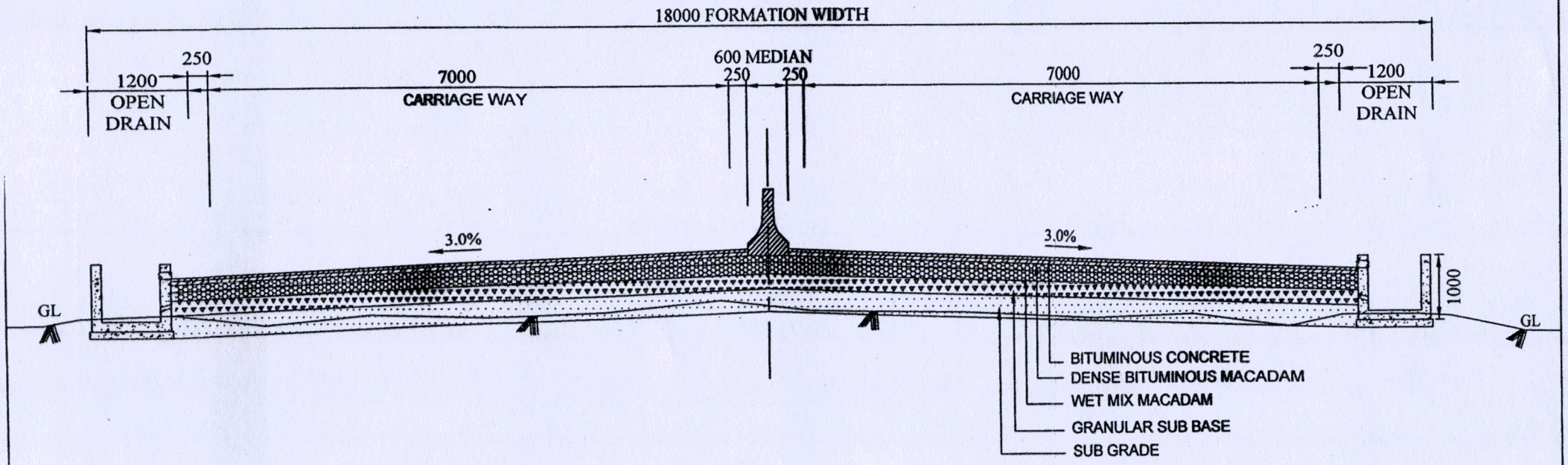
- ✓ Total Length - 42.660 Km
  - ◊ Package 4A - Besthamanahalli (on SH-35 near Anekal) to Hoskote (on NH-4) - At-grade roads only, Length - 39.280 Km
  - ◊ Package 4B1 - Besthamanahalli (on SH-35 near Anekal) to Hoskote (on NH-4) - Elevated Corridor (at Varthur) only, Length - 1.300 Km
  - ◊ Package 4B2 - Besthamanahalli (on SH-35 near Anekal) to Hoskote (on NH-4) - Grade Separators (at Tally Junction, Dommasandra Junction and Varthur Kodi Junction) and ROB (Kadugodi) only, Length - 2.080 Km
  - ◊
- ✓ Lane Configuration
  - ◊ Package 4A - Four Lane Divided Carriageway (except between Sarjapura Police Station-Dommasandara Cross and between Kadugodi and Hoskote - 6 lane divided carriageway)
  - ◊ Package 4B1 -Four lane elevated corridor at Varthur
  - ◊ Package 4B2 - Two lane unidirectional grade separators at Tally junction and Dommasandra Cross, Four Lane bidirectional grade separator at Varthur Kodi junction and two lane unidirectional ROB at Kadugodi)
- ✓ Junction Improvements - 8 Nos.
- ✓ Minor Bridges - 10 Nos.
- ✓ Major Bridges - 1 No.
- ✓ Culverts - 34 Nos. (Reconstruction, Widening & new construction)
- ✓ Grade Separator - 3 No. (at Tally Junction, Dommasandra Cross and Varthur Kodi Junction)
- ✓ Elevated Corridor - 1 No. (at Varthur)
- ✓ ROB - 1 No. (at Kadugodi)
- ✓ Land Acquisition - 13.91 Acres
  - ◊ Package 4 A - 8.32 Acres
  - ◊ Package 4 B1 - 1.78 Acres
  - ◊ Package 4 B2 - 3.81 Acres
- ✓ Construction Cost - Rs.392.60 Crores
  - ◊ Package 4 A - Rs.168.16 Crores
  - ◊ Package 4 B1 - Rs.175.64 Crores
  - ◊ Package 4 B2 - Rs.48.80 Crores
- ✓ Total Project Cost - Rs.732.64 Crores
  - ◊ Package 4 A - Rs.312.08 Crores
  - ◊ Package 4 B1 - Rs. 286.62 Crores
  - ◊ Package 4 B2 - Rs. 133.94 Crores
- ✓ Construction Period - 24 Months

Key Map and Typical Cross Sections

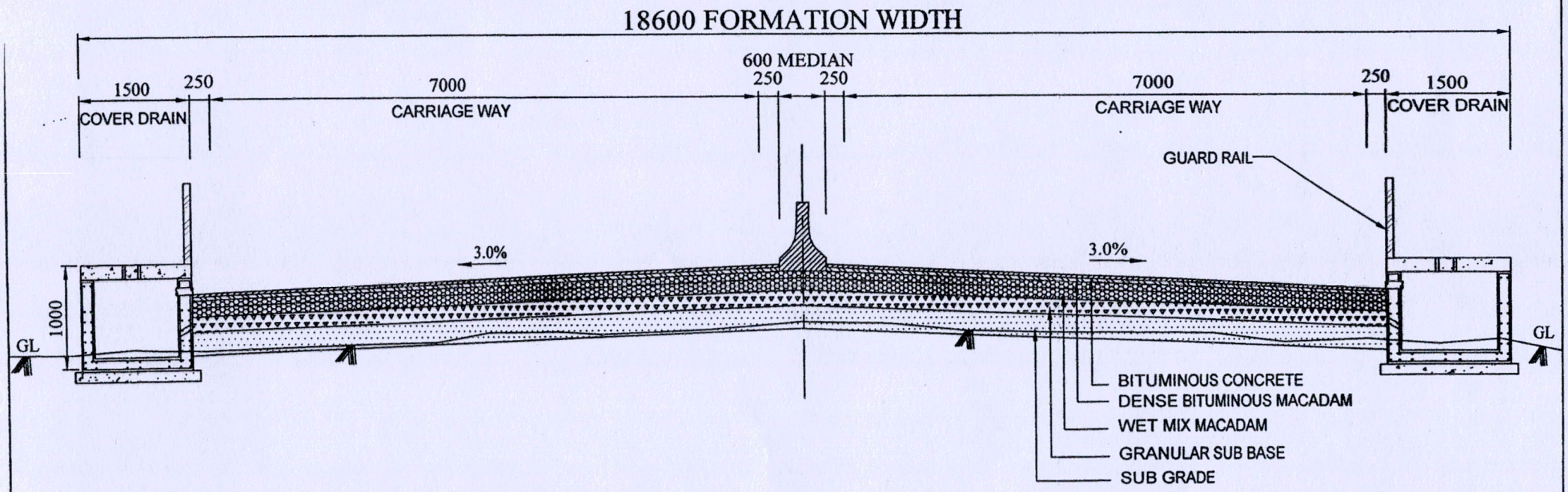
PACKAGE -4 : ANEKAL-ATTIBELE-SARJAPURA-VARTHUR-WHITEFIELD-HOSKOTE



KEY MAP OF THE PROJECT CORRIDOR

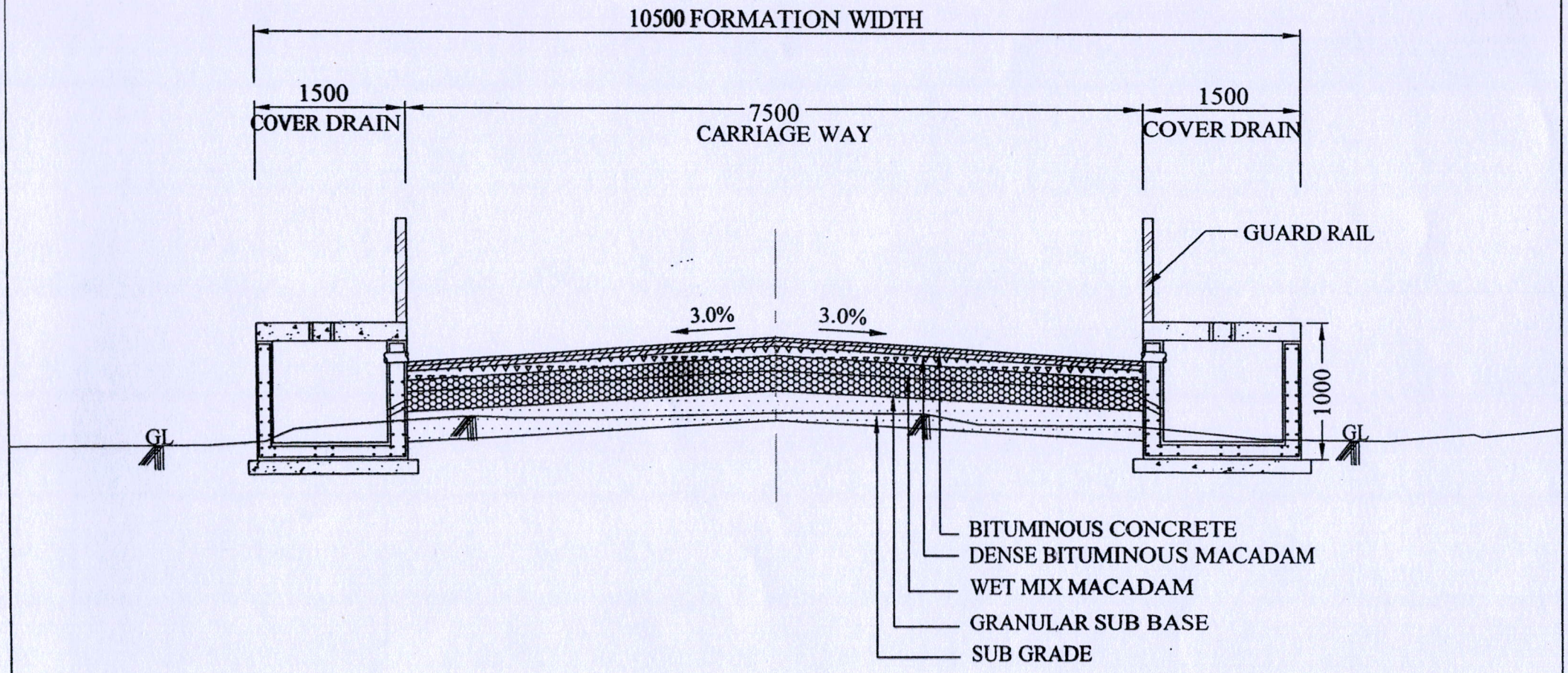


TYPICAL CROSS SECTION
4 LANE DIVIDED CARRIAGEWAY (RURAL SECTION)

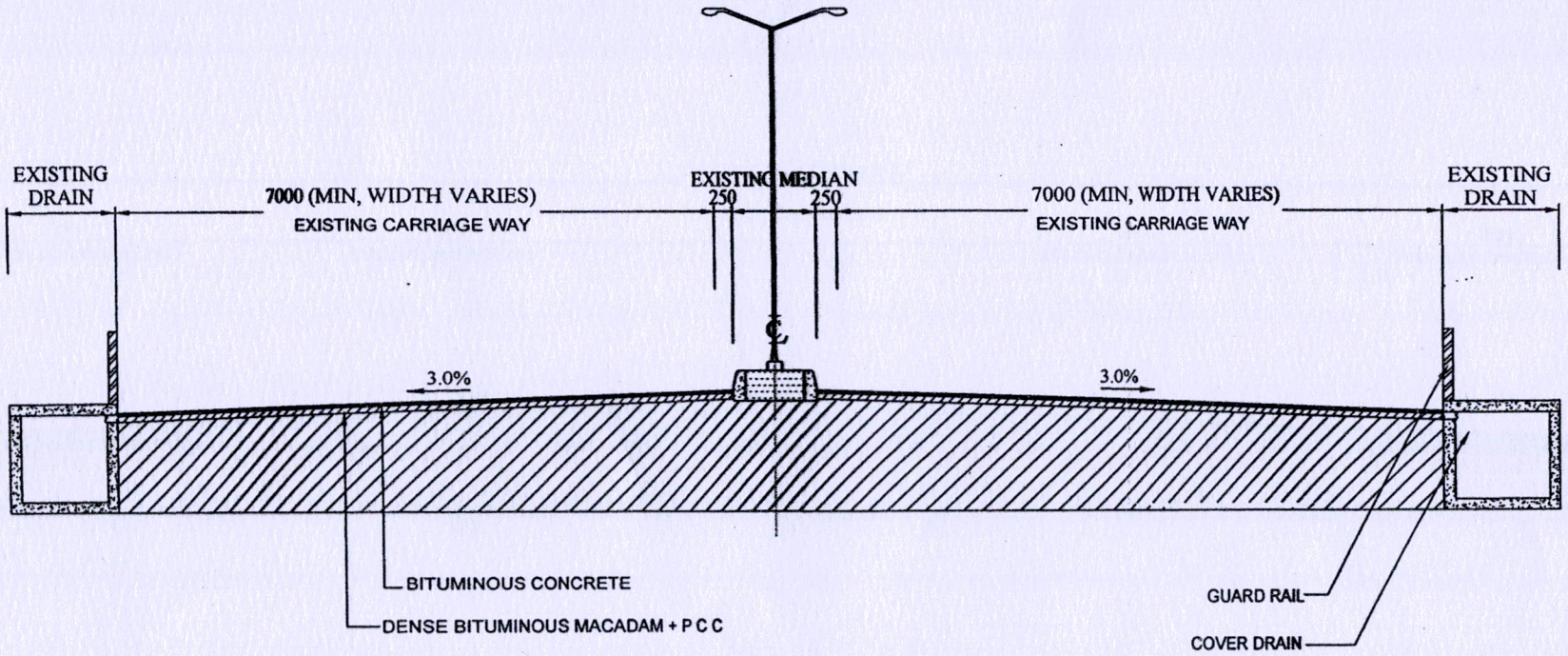


TYPICAL CROSS SECTION
4 LANE DIVIDED CARRIAGEWAY
(URBAN SECTION/VILLAGE/SETTELMENTS)

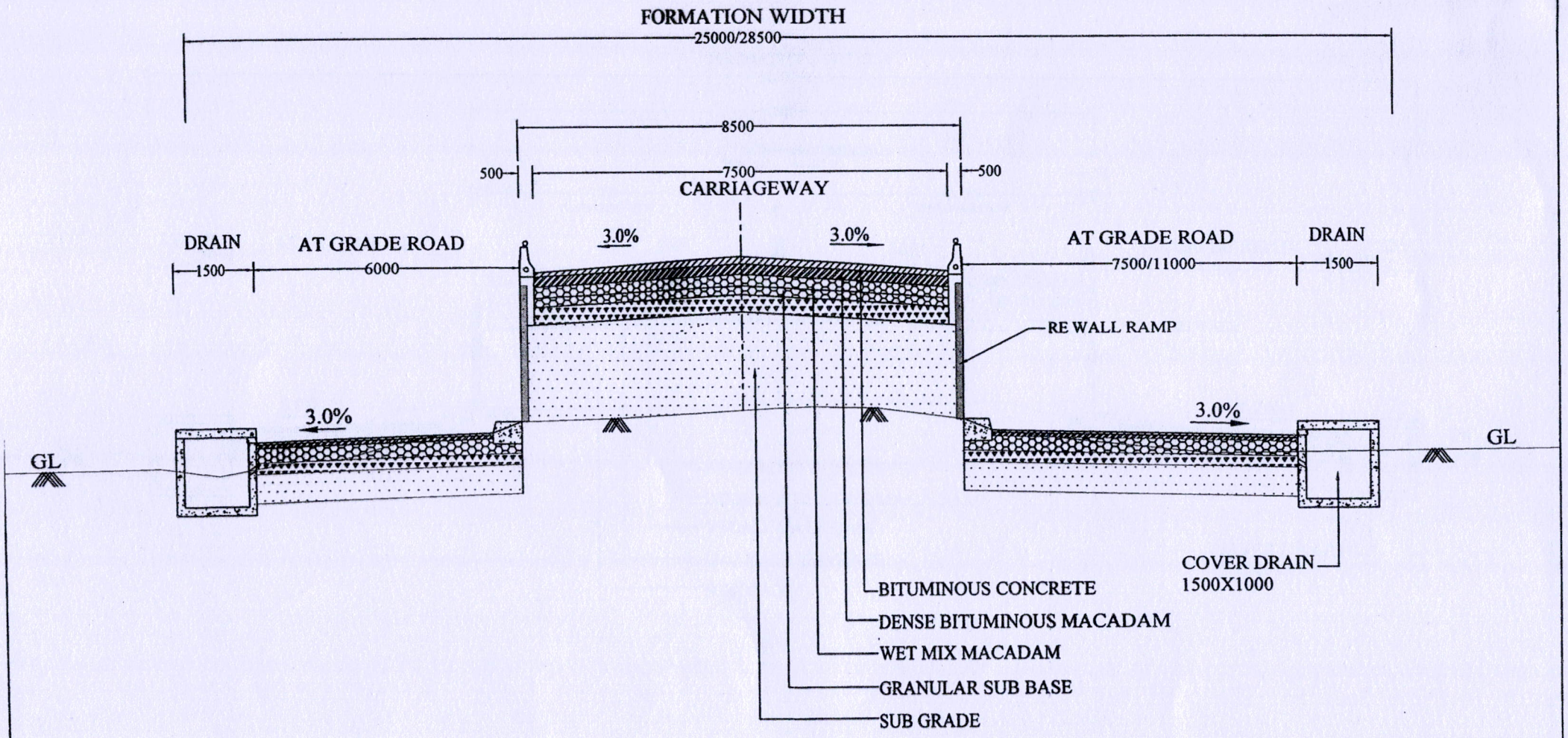
8



TYPICAL CROSS SECTION
2 LANE CARRIAGEWAY (VARTHUR TANK)



TYPICAL CROSS SECTION
4 LANE DIVIDED CARRIAGEWAY
OVERLAY SECTION

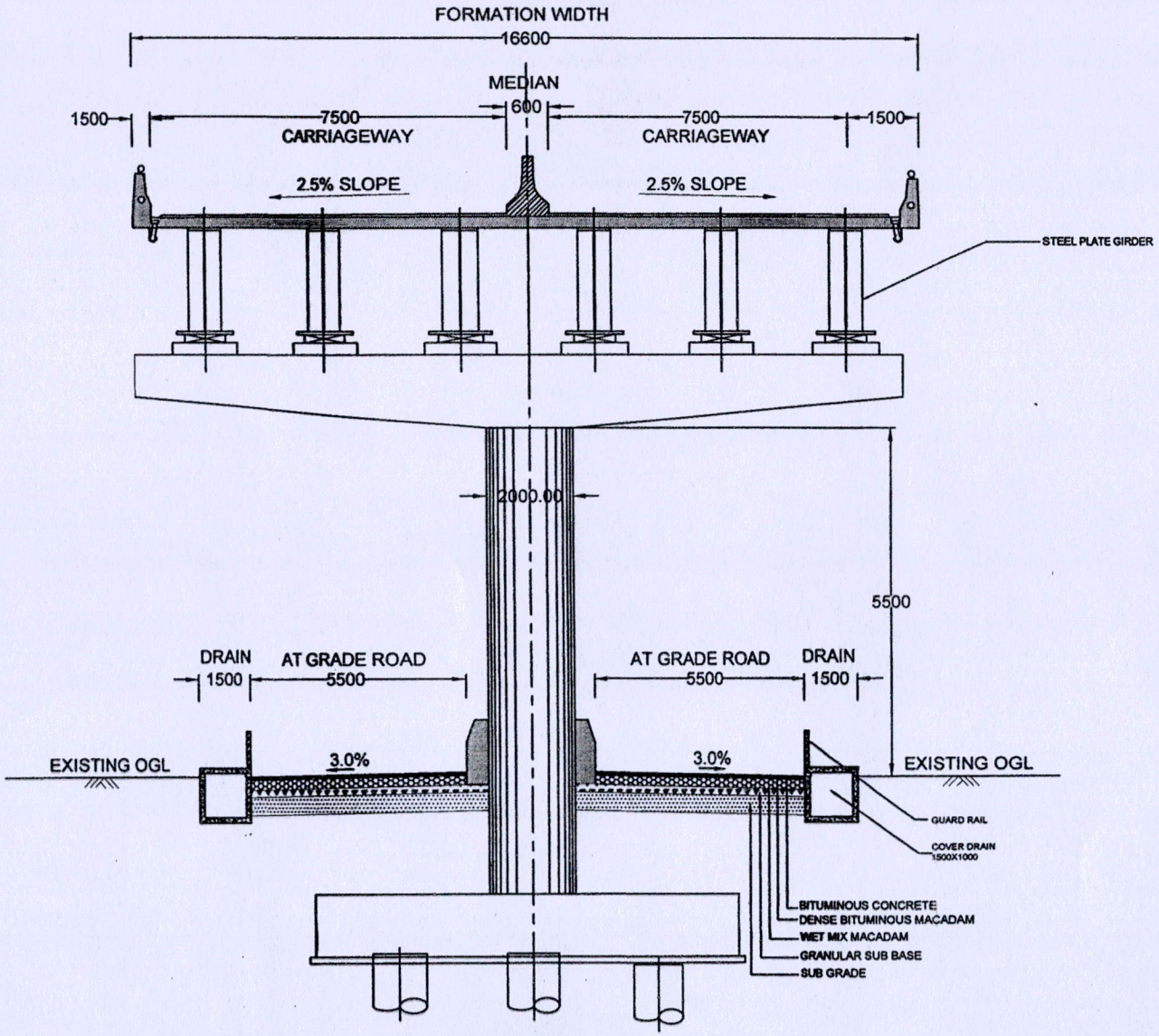


TYPICAL CROSS SECTION
2 LANE GRADE SEPARATOR

NOTE:

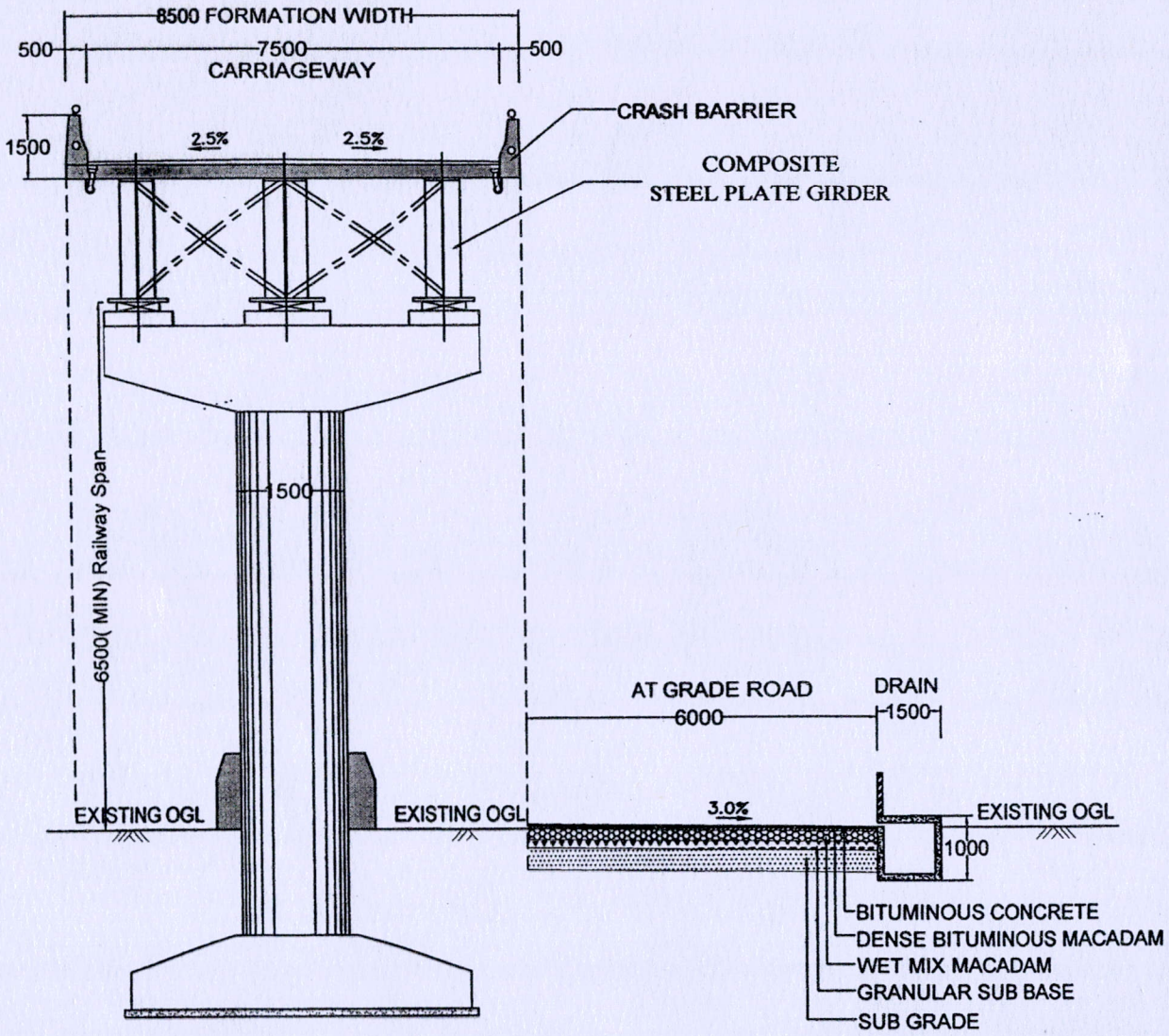
AT GRADE ROAD 7500 AT TALLY JUNCTION

AT GRADE ROAD 11000 AT DOMMASANDRA JUNCTION



TYPICAL CROSS SECTION
4 LANE CARRIAGEWAY
ELEVATED CORRIDOR

2



TYPICAL CROSS SECTION
OF 2 LANE ROB (LAND SPAN)